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THE IMPACT OF TECHNOLOGY ON BUSINESS AND SOCIETY

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ABSTRACT

Technology, specifically the interrelationships of Artificial intelligence (AI), big data, and the Internet of things (IoT), is accelerating its ability to help businesses do more with less and provide better results. Businesses can use technology to decrease time from product idea to product creation and product creation to customer delivery, while using fewer workers. Costs can be cut as automation and robots replace humans who need wages and benefits. Although this will create more products and services at lower prices, it may also decrease the number of consumers for those products and services. There has been significant research in those jobs and activities that can be automated now and in the near future. With jobs disappearing, a new economy is growing that turns employees into contract workers who work from gig to gig in solitude. While this new structure of work may allow some people the work/life balance to pursue their creative goals, for others it may mean a life with no stability or future. The result may be a two-tiered society where the rich can afford expensive products and services, and the poor require governmental assistance because although products can be produced more cheaply, they cannot afford them and so they are not produced.

JEL: M0

KEYWORDS: Technology Disruption, Business and Technology, Sharing/Gig Economy, Peer-To-Peer Structure

INTRODUCTION

Technology is accelerating its ability to help businesses do more with less and provide better results. Artificial intelligence (AI), big data, and the Internet of things (IoT), work together to create programs that businesses can use to decrease time from product idea to product creation and product creation to customer delivery. Manyika et al. (2013) say that "Advances in artificial intelligence, machine learning, and natural user interfaces (e.g., voice recognition) are making it possible to automate knowledge-worker tasks that have long been regarded as impossible or impractical for machines to perform" (p. 6). Big data is "things one can do at a large scale that cannot be done at a smaller one, to extract new insights or create new forms of value, in ways that change markets, organizations, the relationship between citizens and governments, and more" (Mayer-Schönberger & Cukier, 2013, p. 6). Chui, Löffler, and Roberts (2010) define the Internet of Things (IoT) as "sensors and actuators embedded in physical objects—from roadways to pacemakers—[that] are linked through wired and wireless networks, often using the same Internet Protocol (IP) that connects the Internet" (para. 2.). IoT captures data that AI can organize into big data. This paper will look at the major disruptions to society and the economy that are the result of technology's ability to allow businesses to automate work that humans have done. The first section will look at the breakthroughs in technology and how they have changed the structure and processes of business. The second section will look at the meaning of work in society and the possible results of not having work. The third section will look at the sharing economy as a growing segment that could provides jobs with purpose

for many people, but will require changes in business structure and management, government responses, and economic measurement, as well as changes in how citizens' well-being is maintained.

LITERATURE REVIEW

In combination, AI, big data, and IoT provide instant, detailed information about current and potential customers' needs and preferences that then feeds new product ideas. They produced robots that can replace humans in manufacturing, restaurants, retail, and banking. They produced IBM's Watson that can sift through millions of pages of research in seconds to provide doctors information about diagnosis and treatment options that will result in better, more affordable healthcare (Kaplan, 2015, p. 150), and Google's Deep Mind program that can read lips more accurately than human lip readers (Chui, George, & Miremadi, 2017, p. 1). In finance, "Automated trading algorithms are now responsible for nearly two-thirds of stock market trades" (Ford, 2015, p. 56). In customer service, Amazon is piloting Echo Look that will have a camera and microphone and will give you feedback on how items of clothing look on you. In products, 3D printing is printing a toupee that is a biomaterial scalp prosthetic that matches skin and hair color plus hair curl and thickness.

The Triple Pundit: People, Planet, Profit (2015) recently reported that "GE estimates that convergence of machines, data, and analytics will become a $200 billion global industry over the next three years" (para. 1). The analysis of Manyika et al. (2015) "estimates that the IoT has a total potential economic impact of $3.9 trillion to $11.1 trillion a year by 2025. At the top end, that level of value—including the consumer surplus—would be equivalent to about 11 percent of the world economy" (p. 23). More importantly, Chui et al. (2016) argue that today's technologies could "automate 45 percent of the activities people are paid to perform" and "about 60 percent of all occupations could see 30 percent or more of their constituent activities automated, again with technologies today" (para 4). The World Robotics Report 2016 predicts that there will be 2.6 million units by 2019; "today 70 percent of industrial robots are currently at work in the automotive, electrical/electronics and metal and machinery industry segments" (International Federation of Robotics, 2016, para. 3). The World Economic Forum (2015) identified tipping points by 2025 for technology that include an 84% chance for producing a 3D printed car and a 76% chance of a 3D liver being transplanted, as well a 90% chance that 90% of the population will have access to the Internet and a 69% chance that over 50% of Internet traffic will go to appliances and devices in homes (p. 7). Kilham (2014) predicts that "A day will come when almost every worker will collaborate with an AI computer or a robot, and almost every adult will have a robot to help around the house" (p. 89).

> Human labor involves very little "capex," or capital expenditures—up-front payments for things like buildings, machinery and equipment—but high "opex," or operational expenditures, the day-to-day costs such as salary and employee benefits. Robots come with a diametrically opposed cost structure: their up-front capital costs are high, but other operating costs are minor—robots don't get a salary. As the capex of robots continues to go down, the opex of humans becomes comparatively more expensive and therefore less attractive for employers. (Ross, 2016, p. 37)

Boston Consulting Group (2015) predicts the business benefits: "robots will cut labor costs by 33 percent in Japan, 24 percent in Canada and 22 percent in the United States and Taiwan" (para 4).

> Several factors have fueled the AI revolution. Foremost among them is the maturing of machine learning, supported in part by cloud computing resources and widespread, web-based data gathering. Machine learning has been propelled dramatically forward by "deep learning," a form of adaptive artificial neural networks trained using a method called backpropagation. This leap in the performance of information processing algorithms has been accompanied by significant progress in hardware technology for basic operations such as sensing, perception, and object recognition. New platforms and markets for data-driven products, and the economic incentives to

> find new products and markets, have also contributed to the advent of AI-driven technology. (Stanford University, 2016, p. 14)

Business leaders will need to increase their awareness of how these new applications will affect their organizations, both in operations and processes. Technology will also change the way employees work within a company as they learn to work with robots and automation. An avalanche of new algorithms will be able to search big data for information about customers and will provide businesses data about how to satisfy current customers and acquire new ones by understanding how to advertise to them, but businesses must understand how to use technology to support their business objectives.

Technology's Effects on Business

Chui et al. (2017) say that automation "can deliver significant value that is unassociated with labor substitution" (p. 2) and is allowing companies to find new ways to understand the preferences of customers, improve operations by using predictive-maintenance tools, optimize documentation work, and respond immediately to weather changes that affect products. "However, extracting value from automation often entails redesigning entire processes, not just automating individual components of the process (p. 5). They also warn that business leaders must continually look at what competitors are adopting to ensure that any disruptive use of technology does not make a business model obsolete.

Ford (2015) argues that businesses must adopt AI and robots in order to stay competitive because robots can do jobs faster and cheaper than humans can. Automation allows supply to match demand since robots, unlike humans who are paid to continue producing with the excess stored in warehouses that cost money to maintain, can be idled at no cost when demand slows. In addition, of course, robots can work 24/7 and do not require health benefits and vacation, nor do companies that use them pay taxes on the work they do. The few humans that are needed will need skills to use, maintain, and repair the programs and robots, but these skills might not be ones that the majority of those who had done the work can learn. However, to make efficient use of AI and robots, detailed process analyses must be done in order to understand where robots, for example, can improve overall efficiency, not just efficiency of a task. This is especially important because the experts agree that many jobs will have tasks that can be automated, even though entire jobs cannot be. This means that humans' jobs will need to be redefined and training will be needed.

> Robots will produce clear benefits to society. There will be fewer work-related injuries; fewer traffic accidents; safer, less invasive surgical procedures; and myriad new capabilities, from sick, homebound children being able to attend school to giving the power of speech to those who are deaf and mute. It is a net good for the world. (Ross, 2016, p. 42)

However, the world still needs consumers to buy what robots produce. Ford (2015) cites a story about Henry Ford II asking the union boss how he will get the robots to pay union dues and the union boss asking Ford how he will get the robots to buy the cars (p. 193). Robots will change the efficiencies of accomplishing tasks and will decrease costs, but that will require that humans learn to work with robots. Robots currently deliver goods in hospitals, factories, and unload container ships. They take orders, cook, and deliver food in a restaurant in China. They provide counseling services and instruct recovering stroke patients in proper exercise. They operate the pharmacy at UCSF Medical Center. They perform surgery. They provide banking services and investment advice (without a fee). Robotic companies are close to perfecting robots that can pick items from shelves and pack them twice as fast as humans, which means they could "reduce the labor cost of fulfilling online orders by 20%" (Baskin, 2017, para. 7), and, of course, robots can work 24/7. Five years ago, *The Economist*'s Special Report of Manufacturing and Innovation reported that a Japanese manufacturer of industrial robots had reached a point on some production lines that allowed the production to be unsupervised for a week at a time. 3D printing machines can print 24/7 without supervision. However, "All of these automated machines require someone to service them and tell them

what to do. Some machine operators will become machine minders, which often calls for a broader range of tasks" (Making the Future, 2012, p. 19).

Thus, businesses will need to change their processes and analyze their job tasks in order to know what technologies to adopt and how to implement them. They will also have to continue to use technology to monitor the demand for their products, since the financial benefit of automation can diminish if the demand for products does not match the assumptions made when the AI programs or robots were purchased. Businesses will have to provide retraining for employees to learn to operate and maintain robots, and to use the results of big data analytics for strategic decisions. Businesses will also need to pay attention to new products that are being created by the sharing or peer-to-peer (P2P) economy that is increasing as a result of more people losing their jobs.

Technology and the Future of Human Work

> These networks churn out huge volumes of data that flow to computers for analysis. When objects can both sense the environment and communicate, they become tools for understanding complexity and responding to it swiftly. What's revolutionary in all this is that these physical information systems are now beginning to be deployed, and some of them even work largely without human intervention. (Chui, Löffler, & Roberts, 2010, para. 2)

The research shows differences in how economists and technology experts perceive the future as more and more work tasks are automated. Some fear that millions of people will be left without work and income because not enough new jobs will be created for most of them (Clifton, 2011; Ford, 2015; Palmer, 2017). Ford (2015) cites a paper by Beaudry, Green, and Sand in 2013, which found "that around the year 2000, overall demand for skilled labor in the United States peaked and then went into precipitous decline. The result is that new college graduates have increasingly been forced into relatively unskilled jobs—often displacing non-graduates in the process" (p. 127). Others think that this technological revolution will follow the pattern of the industrial revolution and new jobs will be created as the old are automated, just as farm workers moved to factory jobs (Kaplan, 2017; Aeppel, 2015). Kaplan (2017) cites an analysis by the Information Technology & Innovation Foundation that found that 57% of the jobs that workers did fifty years ago, no longer exist today. The timetable for when the new jobs will be created relative to job losses is a subject of contention. "Tomorrow's labor market will be increasingly characterized by competition between humans and robots. In tomorrow's workplace, either the human is telling the robot what to do or the robot is telling the human what to do" (Ross, 2016, p. 247).

Regardless, human labor will be a decreasing driver of economic growth. Labor shortages for many work tasks are pushing technology ahead more quickly. Online retailing has increased the need for thousands of people to pick and pack goods, but it is difficult to find enough humans, so tech companies are in a race to develop robots that can. In many warehouses today, the humans pack the boxes with products brought to them from the warehouse shelves by robots. A result of a survey of senior executives of 315 global companies conducted in 2015 the World Economic Forum (2016) found that technology would have a significant effect on jobs. For top trends in 2015-2017, 34% of the survey responders, rated "Mobile Internet and cloud technology" as a top trend, and 26% cited "Advances in computing power and Big Data." "The Internet of Things," "Advanced manufacturing" and "3D printing." For top trends in 2018-2020, "Artificial intelligence and machine learning," "Advanced robotics and autonomous transport," and "Advanced materials, biotechnology and genomics" were identified as top drivers (World Economic Forum, 2016, pp. 6-7).

Table 1: Employment Effect of Drivers of Change by Job Family

Job Family	Compound Growth Rate 2015-2020
Computer and Mathematical	3.21%
Architecture and Engineering	2.71%
Management	0.97%
Business and Financial Operations	0.70%
Sales and Related	0.46%
Installation and Maintenance	-0.15%
Construction and Extraction	-0.93%
Arts, Design, Entertainment, Sports and Media	-1.03%
Manufacturing and Production	-1.63%
Office and Administrative	-4.91%

(World Economic Forum, 2016, p. 16)

The study identified robotics and autonomous transport, the Internet of Things, advanced manufacturing and 3D printing as four of the top five drivers within the Architecture and Engineering job family, which still has positive growth. Big Data, the Internet of Things, and cloud technology were cited as affecting Office and Administrative Job family. The negative rate of -4.91% will severely affect those in the low and middle sectors of the economy, and these people may not have other options for work unless they can afford retraining (Table 1). Construction and Extraction employees will also be affected at –0.93%; even today, Rio Tinto uses self-driving trucks at one of its mines, and says it has decreased its workforce by a third through automation (Ghost in the Machine, 2017). Thus, it is obvious that global leaders are recognizing the significance of technology disruptors to their industries.

Frey and Osborne (2016) developed a significant quantitative research model matching near-term technologies to job skills required for 702 occupations identified in O*NET, the task measures list from the U.S. Department of Labor. Their research analyzes 702 occupations and ranks them according to probability of being "computerisable" or "not computerisable." They found that 47 percent of U.S. blue-collar and white-collar employment professions are at high risk of significant automation: Service; Sales, and Related; Office and Administrative Support; Farming, Fishing, and Forestry; Construction and Extraction, Installation, Maintenance, and Repair; Production; Transportation and Material Moving. The study identifies "Perception and Manipulation (finger dexterity, manual dexterity, cramped work space, awkward positions)," "Creative Intelligence (Originality, Fine arts)," and "Social Intelligence (social perceptiveness, negotiation, persuasion, assisting and caring for others)," as having a lower chance at present of being automated. However, Chui et al. (2017) point out that robots now have skin that "is able to feel textures and find objects by touch, and robots are becoming more adept at physical tasks (such as tying a shoelace) that require fine motor skills. Thus, robots may increase the chance of those skills being automated. Chui et al. (2016) and Maniyka et al. (2017) also focus on activities rather than occupations. They used O*NET occupations and analyzed both the technical feasibility of automating each activity and amount of time spent on each in the U.S. economy. Their final research showed that

> Almost half the activities people are paid almost $16 trillion in wages to do in the global economy have the potential to be automated by adapting currently demonstrated technology, according to our analysis of more than 2,000 work activities across 800 occupations. While less than 5 percent of all occupations can be automated entirely using demonstrated technologies, about 60 percent of all occupations have at least 30 percent of constituent activities that could be automated. (Maniyka et al., 2017, p. iv)

They identified "Managing others" and "Applying expertise" as "Least susceptible" to automation and "Stakeholder interactions" and "Unpredictable physical work" as "Less susceptible" (although 25% of this activity can be automated). "Data collection," "Data processing," and "Predictable physical work" are "Highly susceptible." However, it should be noted that their study shows only 7% of the time spent in all occupations is in "Managing others" and only 14% in "Applying expertise," 16 % in "Stakeholder

interactions," and 12% in "Unpredictable physical work." On the other end, 17% of time spent in all occupations is in "Data collection," 17% in "Data processes," and 18% in "Predictable physical work" (p. 3). Thus, there is a high percentage of activities that can be automated, but the activities that cannot be automated actually occupy small percentages of employee time. The complete analysis published in 2017 looks at the global environment and includes case studies and sections on the determinants for the speed of future development (Manyika et al., 2017).

Chui, Manyika, and Miremadi (2016) and Kaplan (2015, 2017) see the disappearance of activities in jobs, rather than jobs themselves, thus requiring humans to still do many tasks, and thus consolidating those tasks as jobs for humans. Chui et al. (2016) point out that "one-fifth of the time spent in U.S. workplaces involves performing physical activities or operation machinery in a predictable environment, 78% of which could be automated" (p. 4). Even though the tools will work without humans, for example, in checking for defects in oil pipelines or identifying individual parts of a machine that are close to breaking, humans will still need to manage the resulting actions. Brynjolfsson and McAfee (2014) comment that "While computer reasoning from predefined rules and inferences from existing examples can address a large share of cases, human diagnosticians will still be valuable even after Dr. Watson finishes its medical training because of the idiosyncrasies and special cases that inevitably arise" (p. 192). The same will probably be true of self-driving cars that will be automated only under normal driving conditions. The head of technology and innovation at Rio Tinto's mines in Australia said that automated equipment has replaced drivers, but increased the need for people skilled in a combination of electrical and mechanical engineering, a job that did not exist until now (Aeppel, 2015). The World Economic Forum (2016) and Frey and Osborne (2016) focused on skills and found that the share of work that requires certain skills is decreasing, as is demand, as a result of technological disruption. The World Economic Forum (2016) analyzed the change in demand for skills in all industries (Table 2).

Table 2: Change in Demand for Core Work-Related Skills, 2015-2020, all Industries

Work Related Skills	Scale of Skills Demand in 2020
Cognitive Abilities	15%
Systems Skills	17%
Complex Problem Solving	36%
Content Skills	10%
Process Skills	18%
Social Skills	19%
Resource Management Skills	13%
Technical Skills	12%
Physical Abilities	4%

(World Economic Forum, 2016, p. 22)

The flat demand for Physical Abilities corresponds with the "highly susceptible to automation" that Manyika et al. (2017) found. The importance of increasing demand for Complex Problem Solving skills and Social skills is significant, because they are learned skills that will require training opportunities to develop. These analyses are extremely valuable to business leaders moving forward, but it is important to recognize that technology is also moving forward rapidly. Thus, the perception and mobility tasks assumed by Frey and Osborne (2016) may be computerizable in the near future. Palmer (2017) identifies five jobs that robots will take first: Middle management, Commodity Salespeople, Report Writers like sports and financial writers who report numbers, accountants and bookkeepers, and doctors (para. 2). Aquino (2012) also cites sports writers, and adds pharmacists, baby sitters, and soldiers.

> There are still limitations. Machines lack common sense, cannot always pick up on social and emotional cues, and still struggle to understand and generate natural language. Yet the pace of technological progress, propelled by massive increases in computer power and cloud storage, suggests the next frontier will soon be crossed" (Chui et al., 2017, p. 1).

Other Forces

In addition to the speed of jobs being lost through automation, many economists and experts also see another force that also decreases the number of jobs—the restructuring of a business to decrease size and cost. There is the current move by U.S. companies to shift work to contractors, which leads to lower pay and few, if any, benefits. "Some large U.S. companies outsource 20-50% of their workforce" (Weber, 2017, para. 8). Deloitte's chief talent officer said, "as much as 40 percent of the U.S. workforce may be part-timers by 2020" (as cited in Green, 2015, para. 24). By outsourcing entire job units with the employees to contractors, companies have avoided being perceived by the government and social media as laying off employees. The government and social media definitely criticize if a company lays off workers by replacing them with robots, but if the jobs are outsourced first, the company can then automate processes and this will decrease the number of employees it needs from the outsourcing companies. The outsourcing firms hire contract workers as needed for specific tasks for specific time periods, so they do not offer benefits like health or retirement. "Changing work environments and flexible working arrangements" is one of the trends World Economic Forum (2015) reported that as having a current impact.

Another parallel trend is that as companies decide to move manufacturing back to the U.S. in response to increasing wages in other countries and increased transportation costs, they build new plants that are automated from the beginning. Fewer humans will be hired than would have been in an older factory. Although a new plant may increase a geographic area's available jobs, the historical number of employees and support industries cannot be used to predict future ones. Additionally, individual countries are requiring businesses to manufacture products in-country rather than import them. As companies make more products closer to their consumers, in some cases in response to this demand of individual countries, the global supply chain is changed. Jobs in transportation may diminish as transportation companies try to cut costs and move to more automation on ships, and using robots to unpack them. Amazon has a patent for a container that would be operated on rail or road that would use drones to take products from the container to the customer's door.

New companies are starting with technology so they become profitable with fewer people. AT&T was the most valuable company in 1964; today Google is worth 1B more but with less than a tenth of AT&T's workforce (Thompson, 2015). Ford (2015) points out that YouTube was founded by three people who employed sixty-five people and sold the company in two years to Google for $1.65 billion. He also cites an example of the CEO of Good Data that uses Amazon's cloud services for data analysis who said that before technology, he would have had to hire 30,000 employees to service 6,000 clients, but now he needs only 180 employees. "With 6,000 clients I don't know what all those other people will do now, but this isn't work they can do anymore. It's a winner-takes-all consolidation" (Ford, 2015, p. 107). New industries are most labor-efficient, but they do not require many people. Schwab (2016) notes that there is a change in definition and value of ownership: Amazon, the largest retailer, does not own stores, Uber, the largest transportation provider does not own cars, and Airbnb, the largest provider of sleeping rooms does not own hotels (p. 159).

The Work Humans Will do

There is a group of experts who focus on the importance of work to the American society. "The sanctity and preeminence of work lie at the heart of the country's politics, economics, and social interactions. What might happen if work goes away" (Thompson, 2015, p 52)? "The purpose of our economy is to serve the public interest, rather than the other way around" (Kaplan, 2015, p. 164). Thompson (2015) says ". . . one pursues a calling not only for pay or status, but also for the intrinsic fulfillment of the work itself" (p. 61).

Part-time work is creating a new type of economy, alternatively called the sharing, peer, or gig economy. Whether peer to peer (P2P) or gig, the economy is based on sharing of talent and resources. However, in

terms of whether part-time work is a path to fulfilling one's purpose or passion is a subject of disagreement. It is possible that elimination of full-time jobs make a new artisanal economy focused on self-expression. Thompson (2015) argues this might bring independence, and a chance to develop one's talents and focus on one's purpose: "The next wave of automation could return us to an age of craftsmanship and artistry" (p. 59). However, Schwab (2016) is concerned that only a few will actually be able to have this kind of work and life, and even Thompson (2015) recommends that a minimum income for all would be necessary. "Several economic studies have found that the overall self-reported level of happiness is highest when the economic disparities in society are minimized, even after controlling for all other known factors" (Kaplan, 2015, p. 164). This would be an improvement from the lack of purpose today's employees feel.

A 2017 Gallup report of worker satisfaction found that as many as 70% of Americans do not feel engaged by their current jobs. "Purpose, meaning, identify, fulfillment, creativity, autonomy—all these things that positive psychology has shown us to be necessary for well-being are absent in the average job" (Hunnicutt as cited by Thompson, 2015, p 55). Green (2015) found that although some young, educated workers do not want to commit to one particular job or employer because they don't want to repeat their parents' experiences of committing to a career or employer for years only to be laid off, many others want more work/life balance, and want to work part-time so they can do what they have time to be creative and do what they are passionate about. A true peer-to-peer (P2P) structure is one in which people buy and sell directly to one another without a business structure or third party, in either person or, more often, through an Internet site set up by the seller. Amazon and eBay provide the Internet platform for a fee, so this adds a third party. Brynjolfsson and McAfee (2014) suggest that a peer economy allows people to do meaningful work; they can make the things they create easily available for others to buy.

Green (2015) describes the Freelancers Union, which coordinates health insurance and retirement plans for freelancers and part-time employees who do contract work for companies and work in the peer economy, as one support group that can develop the foundation for stabilizing a sharing economy. Brynjolfsson and McAfee (2014) also suggest that entrepreneurs will create their own businesses, but there is a pattern showing that those who succeed have difficulty growing because the big companies will either copy their product or service or buy them out.

The other side of the sharing economy is one in which people cannot make a living doing work that is meaningful to them. It is also possible that some people have to put together a string of jobs that are not meaningful in order to survive, and with the knowledge that the availability of future jobs are uncertain. This is the gig economy. It has created a new business structure that provides gigs, mostly short term or part-time, through the Internet. For example, Uber hires drivers to transport people, Seamless hires drivers to deliver meals, Homejoy hires housecleaners, Airbnb connects travelers and renters, and Task Rabbit connects people who need specific jobs done with those who can do them, for fees from the one needing the work done and from the one doing the work. Heller (2017) cites a 2016 Pew study that "found that seventy-two per cent of American adults had used one of eleven sharing or on-demand services, and that a third of people under forty-five had used four or more" (para. 15). One element that is increasingly important in the sharing economy is social media. Social media can provide reams of data for AI to analyze and interpret about individual customer needs, but it can also mean a level of accountability that has not been required in the past.

> No longer can a seller of substandard services expect to feed on a continuing stream of naïve or ill-informed consumers. No longer can the seller expect to be insulated from competitors in other locations who can deliver a better service for less. Research by Michael Luca of Harvard Business School has found that the increased transparency has helped smaller independent restaurants compete with bigger chains because customers can more quickly find quality food via rating services like Yelp, reducing their reliance on brand names' expensive marketing campaigns. (Brynjolfsson & McAfee, 2014, p. 118)

The next gig may depend on what one's current customer says online about satisfaction. Whether this model will provide a sustainable income for enough people and what changes will be necessary for laws, particularly tax laws, is the big question. In Eggers' novel *The Circle* (2014), customer service employees spend much of their time sending emails to customers encouraging them to change their ranking of 8 or 9 to a 10. The sharing/peer/gig economy requires understanding the responsibilities of independent contractors for federal and tax purposes. The IRS has a Web page called "Sharing Economy Tax Center" that explains that regardless of the lack of a Form W-2 or Form 1099 from the person who contracted your services, gig income must be reported. This may require the federal government to allocate more resources investigating whether individuals who report no income are actually contract workers. Heller (2017) describes one company that makes all of its gig workers W-2 employees because, although it is more expensive, attrition is low.

> Just as free goods rather than physical products are an increasingly important share of consumption, intangibles also make up a growing share of the economy's capital assets. Production in the second machine age depends less on physical equipment and structures and more on the four categories of intangible assets: intellectual property, organizational capital (new business processes techniques of production), user-generated content, and human capital. (Brynjolfsson & McAfee, 2014, p. 119)

Social

Thompson (2015) took a first-hand look at a peer economy in Youngstown, Ohio, after its steel mills had shuttered. Between 1977 and 1982, the town lost "50,000 jobs and $1.3 billion in manufacturing wages. The effect was so severe that a term was coined to describe the fallout: 'regional depression'" (p. 51). When he returned in 2015, he found a city of people doing gig work. Some were happy to have time to follow their passions, but others just watched television or played video games when they had no work. Hunnicutt says the unemployed "sleep and watch television because of loss of status and demoralization. People are happier complaining about jobs than they are luxuriating in too much leisure. Unproductive downtime leads to guilt. Pride is based on past accomplishments" (as cited in Thompson, 2015, p. 55). Additionally, the social community that is part of a workplace is gone, not just as people join the gig economy, but as they work virtually when they have full-time jobs. "Problems caused by unemployment move beyond the personal sphere; widespread joblessness shatters neighborhoods and leaches away their civic spirit" (Ford, 2017, p. 580). Heller (2017) tells of a gig worker who came to hang some artwork on Heller's walls who told him that

> He rarely met other taskers, he said; there were no colleagues in his life with whom he could share experiences and struggles. The flexibility was great, if you had something to be flexible for. "The gig economy is such a lonely economy," he told me. He left his drill behind after he finished the work, but I was out when he returned the next day to get it. I never saw him again. (para. 95)

"Contrary to the past, the notion of belonging to a community today is more defined by personal projects, individual values and interests rather than by space (the local community), work, and family" (Schwab, 2016, p. 94). Bailenson says that virtual-reality technology will replace today's social life with a 'cyberexistence' (as cited in Fowler, 2016). This is foreshadowed by the experiences in the online community called Second Life years ago. People created new identities in the form of avatars and then bought property, built houses, and bought and sold 'products;' they even put money in banks without realizing the banks were not legitimate and the bank 'owners' stole the money. Avatars even married other avatars (even though the 'owners' had spouses in real life), and one woman filed for divorce based on her husband's 'second wife' on Second Life. Another woman killed her husband's avatar because he was 'married' to another avatar; the husband tried to have her convicted of murder in the real courts.

> What does the "end of work" mean, exactly? It does not mean the imminent of total unemployment, nor is the United States remotely likely to face, say, 30-50% unemployment within the next decade. Rather, Technology could exert a slow but continual downward pressure on the value and availability of work—that is, on wages and the share of prime-age workers with full-time jobs. (Thompson, 2015, p. 53)

Another technological change discussed by Kelly (2016), Ross (2016) and Schwab (2016) that will be used by the sharing economy, especially B2B, will be bitcoin and digital currencies, which are based on the idea of a distributed trust mechanism called the *blockchain*, a way of keeping track of trusted transactions in a distrusted fashion. "Forty-eight% of respondents said that the tipping point of 10% of global gross domestic product (GDP) stored on blockchain technology will be met by 2025" (Schwab, 2016, p. 155).

> Certainly, automation can be used to transform the costs of a process by reducing labor costs, for example, when end-to-end digitization is used to create straight-through processing of a transactional process. As we have also documented, automation can not only enable a reduction in labor costs, it can also bring a range of other benefits related to performance improvements, such as greater throughput, improved reliability, raised quality, better safety, and other gains. Some forms of automation, for example those that are based on machine learning techniques such as deep learning, improve their performance over time when they have access to more data. (Manyika et al. 2017, p. 110)

Two Tier Society

One scenario for this new economy sees a split society where there would be no middle class. There would be the rich, who make money by creating new products, manufacturing robots, or working for service providers like Facebook, Amazon, Airbnb, Homejoy, Uber, and TaskRabbit. This group would also include employees who are on the payroll whose skills are necessary because employers could pay them higher wages as automation brings down the cost of products and services (Brynjolfsson & McAfee, 2014, p. 143). The poor would work lower-end jobs for those who are rich and still want to hire humans as gardeners and housekeepers and babysitters using the gig economy. "People pay more to watch a barista brew their latte than for a comparable product from a vending machine" (Kaplan, 2017, para. 11).

> For the first time since before the Great Depression, over half the total income in the United States went to the top 10% of Americans in 2012. The top 1 percent earned over 22 percent of income, more than doubling their share since the early 1980s. The share of income going to the top hundredth of one percent of Americans, a few thousand people with annual incomes over $11 million, is now at 5.5% after increasing more between 2011 and 2012 than any year since 1927-28. . . . The top 20% got more than 100% of the increase and the bottom 80% saw a net decrease. The top 1% increased their earnings by 278 percent between 1979 and 2007, compared to an increase of just 35% for those in the middle of the income distribution. Between 1973 and 2011 the median hourly wage only grew 0.1 percent per year, but productivity grew an average of 1.56% per year. (Brynjolfsson & McAfee, 2014, p. 129)

Thompson (2015) calls the working class the 'Precariat,' "a working class that swings from task to task in order to make ends meet and suffers a loss of labor rights, bargaining rights, and job security" (p. 58). One problem with this model is that the economy is based on the rich spending their money on goods and services. "Spreading long-term social benefit is hard. . . . If gigging platforms are necessary to keep people in cash, the model's social erosions have to be curbed. How can the gig economy be made sustainable at last?" (Heller, 2017, para. 67).

> Is this the beginning of a new and flexible work revolution that will empower any individual who has an Internet connection and that will eliminate the shortage of skills? Or will it trigger the onset of an inexorable race to the bottom in a world of unregulated virtual sweatshops. . . . The challenge we face is to come up with new forms of social and employment contracts that suit the changing workforce and the evolving nature of work. We must limit the downside of the human cloud in terms of possible exploitation while neither curtailing the growth of the labour market nor preventing people from working in the manner they choose. (Schwab, 2016, p. 48)

Government Changes

Business leaders must confront the possible futures they face. They need to review their business purpose, products, and processes in the light of a sharing economy that may make products they produce available at cheaper prices or artisan versions of those products that cannot compete with their products. They must understand how technology will affect not only them, but also their competitors, since the automation a competitor uses may undercut the price. More importantly, they must demand that government respond to this sharing economy so that there are consumers. If most of the population works in the gig mode, they may be only able to afford the basics. Autonomous vehicles in a sharing economy may mean people do not need the expense of owning a car, or tools, or lawn equipment; they could use them on an as-needed basis from someone else in exchange for providing something of value for that person, whether it be an object or a service. Not only would the sales of things decrease, but the parts of the economy that supported the use of those things would decrease also, like parking garages and storage facilities, or even back-yard sheds. The consumer economy diminishes when you take away the consumers.

"Overall, robots can be a boon, freeing up humans to do more productive things—but only so long as humans create the systems to adapt their workforces, economies, and societies to the inevitable disruption" (Ross, 2016, p. 37). However, at a 2017 U.S. National Governors Association meeting, Elon Musk said that a regulatory agency was needed to control development of AI, because not only it would threaten human jobs but also it could spark a war (Higgins, 2017). "In a million small ways, next-generation AI apps will lessen the friction of modern life. Living without them will seem, in retrospect, like driving with no springs or shocks" (Gelernter, 2016, para. 5). This might lead to the dystopia that AI created in Egger's novel, *The Circle* (2014). The response to the disruption must come from government, not only in terms of supporting businesses in this new sharing economy, but also in terms of supporting workers who live in the sharing economy. Taxes that provide for workers' well-being, like social security and worker's compensation will diminish as millions of workers work on a gig basis, and companies pay taxes on the few employees they have left. Blockchain and digital currencies will also allow people in the sharing economy not to have public transactions of money they have made on which to pay taxes.

Many of the experts (Brynjolfsson & McAfee, 2015; Ford, 2015; Kaplan, 2015; Kelly, 2016; Ross, 2016; Schwab, 2016) discuss the need for the government to provide either work, like the Work Projects Administration's projects during the Great Depression, or the Civilian Conservation Corps (Brynjolfsson & McAfee, 2015; Kaplan, 2015), or paying people via nonprofits to do socially beneficial tasks, or provide a basic guaranteed income to maintain society (Ford, 2015; Ross, 2016). Other suggestions are job sharing and incubators, which would require that businesses be involved. Kaplan (2015) says we must teach the surplus workers with obsolete skills new ones: "We need to teach old dogs new tricks—but not just any tricks, tricks that employers will pay them to perform. And the only people who know for sure what tricks these are, are the employers themselves" (p. 152). Brynjolfsson & McAfee (2014) recommend instituting Pigovian taxes.

> First, they reduce the amount of undesirable activity; if a utility is taxed based on the amount of sulfur dioxide it releases into the atmosphere, it has strong incentives to invest in scrubber technology that leaves the air cleaner. Second. Pigovian taxes raise revenue for the government,

> which could be used to compensate those harmed by the pollution (or any other purpose). They're a win-win. (p. 225)

New Economic Metrics are Needed

> The intangible benefits delivered by the growing sharing economy—better matches, timeliness, customer service, and increase convenience—are exactly the type of benefits identified by the 1996 Boscin Commission as being poorly measured in our official price and GDP statistics. This is another way in which our true growth is greater than the standard data suggest. (Brynjolfsson & McAfee, 2014, p. 119)

As Kaplan (2015) reports, "In fact, there are two groups of people without jobs. The first are those who are looking for a job and can't find one, Indeed, that's the official U.S. Bureau of Labor Statistics definition of being unemployed. The other group is what the bureau calls "not in the labor force," which includes retirees. This does not mean these people are not working, just that they are not getting paid for working" (p. 170).

> With a greater volume of digital goods introduced each year that do not have a dollar price, this traditional GDP heuristic (units produced) is becoming less useful. . . . The U.S. Bureau of Economic Analysis defines the information's contribution to the economy as the sum of the sales of software, publishing, motion pictures, sound recording, broadcasting, telecommunications, and information and data processing services. According to the official measures, these account for just 4% of our GDP today, almost precisely the same share of GDP as in the late 1980s, before the World Wide Web was even invented. But clearly this isn't right. The official statistics are missing a growing share of the real value created in our society. (Brynjolfsson & McAfee, 2014, p. 112

Brynjolfsson & McAfee (2014) recommend that the human development index be used to fill in some of the gaps in official GDP statistics. They also recommend using the multidimensional poverty index that considers indicators like nutrition, sanitation and access to water, and also the Gallup-Healthways Well-Being Index that has many years of data (p. 123).

> What's more, the collapse in the share of GDP going to labor actually understates how the situation has deteriorated for the typical workers. The official measure of labor compensation includes soaring wages for a small number of superstars in media, finance, sports, and corporate positions. . . . While the share of national income to capital has been growing at the expense of labor, economic theory does not necessarily predict that this will continue, even if robots and other machines take over more and more work. The threat to capital's share comes not (just) from the bargaining power of various types of human labor, from CEOs or labor unions, but, ironically, from other capital. In a free market, the biggest premiums go to the scarcest inputs needed for production. In a world where capital can be replicated at a relatively low cost (think of computer chips or even software), the marginal value of capital will tend to fall, even if more capital will be used. (Brynjolfsson & McAfee, 2014, p. 145).

A Path Forward

Business leaders will need to pay closer attention to the technology that is on the horizon, not just the applications that are being marketed. This will require evaluating their work processes to identify which tasks can be automated, and who is now doing those tasks. As the studies demonstrate, automating tasks can sometimes mean employees will no longer do 50% of the tasks they currently complete. Thus, layoffs will not be easy. Some employees who are being kept on the payroll may require training to take on tasks that they do not have now, but which those who are being laid off do. This analysis may then lead to a

decision to keep only those jobs that are core to the business and contracting out others. However, this may require new processes to identify acceptable contract employees and manage them as possibly gig workers. Leaders will also need to analyze the skills necessary for employees who are moving into new positions. If those positions need problem solving skills or social skills, a decision about whether to hire someone new that has the necessary skills or retrain existing employees must be made. Obviously, the more robots and 3D printers that are introduced to the organization, the more need for people who can maintain and repair them. The more AI and IoT is used, the more employees are needed to ensure that there are no data breaches, that appropriate data is accessed, that algorithms are correctly created, and this may require new skills that current employees do not have.

Government agencies need to understand the possible impacts of technology not only on how society operates, both positive and negative. This includes assuring that an individual's personal information is safe from hackers, and that businesses do not sell or give away that data to other businesses. If there is a movement toward a gig economy and a 'precariat,' this will require changes to access to healthcare since most citizens will not have it. There may also be negative changes in taxes, as those who are in the gig economy do not pay taxes on their work, and as companies hire fewer and fewer full-time employees for whom they must pay taxes and report income. Homelessness may rise without the funds to provide affordable housing. Education institutions must also adapt to ensure that students provided opportunities to develop problem solving, systems, process, and social skills that will be necessary in the new workplace. Additionally, students must have learning experiences with the technology, such as robots and 3D printers. They must know how to write an algorithm and how to request data from Watson. They must know how to analyze and evaluate the data they receive. If the possibilities of the gig economy allow people to live their dreams and be creative, schools must help students understand how to earn money from doing what was just a pastime in the past. The research demonstrates that technology is progressing rapidly, more rapidly in some areas than others, but business and society must be prepared for the technological shifts before they come, not after. Automated cars will change transportation infrastructure needs, and parking structures may be archaic if the automated car meets Uber. Electric vehicles have already changed the need for parking places that have chargers. 3D printers will decrease the need for shipping parts, which will disrupt global trade. Scenario thinking and asking "What if?" is more important than ever so that business and society are prepared for the future.

CONCLUSION

As physical and organizational boundaries are becoming increasingly blurred, organizations are going to have to become significantly more agile in the way they think about managing people's work and about the workforce as a whole. Work is what people do and not where they do it. Businesses will increasingly connect and collaborate remotely with freelancers and independent professionals through digital talent platforms. Modern forms of association such as digital freelancers' unions and updated labour market regulations will increasingly begin to emerge to complement these new organizational models. For policymakers, an important set of regulations concerns the portability of safeguards and benefits between jobs and the equivalent treatment in law of different forms of labour and employment types. (World Economic Forum, 2016, p. 30) Even if a company is completely automated, demand must be there. 3D printers may allow artisans to create their own products and eBay may allow them to be sold B2B, but there still needs to be a demand. Supply may increase as more people can follow their dreams. As people who use Airbnb have discovered, renting your room or apartment is easier before the neighborhood becomes a place travelers want to stay. Then you may have more competition so you may have to spend money upgrading your dwelling. You may also have so many customers that you spend time and money cleaning than following your own passion, which was what the room rental was supposed to provide. Many artists and musicians have had other jobs so they could afford to follow their passion of creating art and music. Now those jobs will be gone, but there may be more people trying to make money in artistic endeavors. The demand for any product or service must exist, even for robots. Brynjolfsson and McAfee (2014) claim

that the best solutions will come from creativity and innovation that increase the value of human labor (p. 245). For business leaders, Manyika et al. (2017) highlight the new responsibilities.

Companies who recognize both the opportunities and threats of automation to competitiveness will engage and embrace the potential that these technologies represent, prioritizing a set of active experiments to start climbing the learning curves earlier rather than later. To help diagnose where automation could most profitably be applied to improve performance, business leaders may want to conduct a thorough inventory of their organization's activities and create a heat map of where automation potential is high. Business processes shown to have activities with high automation potential could be reimagined under scenarios where they take full advantage of automation technologies (rather than mechanically attempting to automate individual activities using current processes). The benefits and feasibility of these automation-enabled process transformations could then be used to prioritize which processes to transform using automation technologies. Business leaders and their organizations will also need to become more knowledgeable about the evolution of the technologies themselves, understanding the art of the possible, and the potential for the future, in order to best position their enterprises to take advantage of automation. This is not just "book knowledge" that comes from reading about technologies, or visiting global centers of innovation, but practical knowledge that comes from devoting some resources to continually and purposefully experimenting with technologies on real problems, and then scaling those that demonstrate promise. Perhaps the most vital component to being successful at deploying automation is the hard work that has to be done to prepare and adapt human capital to work in complementary ways with technology. (Maniyka et al., 2017, p. 111)

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